AMENDMENTS TO THE SPECIFICATION:

Page 1, please add the following new paragraphs before paragraph [0001]:

[0000.2] CROSS-REFERENCE TO RELATED APPLICATIONS

[0000.4] This application is a 35 USC 371 application of PCT/DE 03/00876 filed on March 18, 2003.

[0000.6] BACKGROUND OF THE INVENTION

Please replace paragraph [0003] with the following amended paragraph:

[0003] ~~Background of the Invention~~ Description of the Prior Art

Page 3, please replace paragraph [0008] with the following amended paragraph:

[0008] ~~Summary of the Invention~~ SUMMARY OF THE INVENTION

Please replace paragraph [0010] with the following amended paragraph:

[0010] Incorrect metering, that is, deviations in the metered quantity of raw fuel from its set-point value, can be detected and ~~if needed~~ corrected if necessary. For the embodiment according to the invention, components (in particular pumps) in accordance with the prior art, in which only slight modifications have been made, can advantageously be employed. As a result, an economical embodiment that can be mass-produced is presented. These advantages are attained according to the invention by a reforming system for a fuel cell~~. The reforming system~~ that includes an evaporating device for evaporating a raw fuel and for delivering the evaporated raw fuel to a reforming unit. It also includes at least one pump for metering the raw fuel that is conducted into the evaporating device and also includes a control unit. According to the invention, at least one pump is a metering pump whose rpm is regulated. Moreover, at least one monitoring device serves to monitor the metering quantity of the raw fuel through the regulated metering pump.

Page 6, please replace paragraph [0021] with the following amended paragraph:

[0021] In one version of the present invention, a pressure damper damps the pressure pulsations, which have a feedback effect, that are caused by the at least one pump or by the system (such as the evaporator). By means of the pressure damper, the pressure pulsations are damped or even smoothed out entirely. This has favorable effects on the reforming process.

Please replace paragraph [0022] with the following amended paragraph:

[0022] A method for regulating the metering quantity of an electric fuel pump in a reforming system of the invention is also the subject of the present invention; a variable ascertained with a monitoring device serves as a controlled variable for the regulation. The ~~regulation~~ regulator receives as a controlling variable the rpm of the regulated electric fuel pump, which is set by means of the timing module.

Page 9, please replace paragraph [0032] with the following amended paragraph:

[0032] ~~Drawing~~ BRIEF DESCRIPTION OF THE DRAWINGS

Please replace paragraph [0033] with the following amended paragraph:

[0033] The invention will be described in further detail below in conjunction with the ~~drawing.~~ drawings, in which:

Please delete paragraph [0034].

Please replace paragraph [0035] with the following amended paragraph:

[0035] Fig. 1~~;~~ is a schematic illustration of part of a reforming system of the invention, with two pumps;

Page 10, please replace paragraph [0043] with the following amended paragraph:

[0043] ~~Variant Embodiment~~ DESCRIPTION OF THE PREFERRED EMBODIMENTS

Please delete paragraph [0044].

Please replace paragraph [0045] with the following amended paragraph:

[0045] The reforming system shown in Fig. 1 includes a tank 1, which contains a raw fuel. It also includes two pumps 2, 3, which pump the raw fuel via the lines 4 and 5 into an evaporating device 6. In the case shown, these are a prefeed pump 2 and a high-pressure pump 3 driven by an electric motor 7. However, two electric fuel pumps connected in series would also be conceivable.

Please replace paragraph [0046] with the following amended paragraph:

[0046] The quantity of raw fuel metered in the evaporating device 6 is regulated, in the embodiment shown of the present invention, via the rpm of the electric motor 7 of the high-pressure pump 3. A control unit 8, via a connection 9, triggers the electric motor 7 for regulating the rpm of the second pump 3. The prefeed pump 2 is for instance an electric fuel pump that is in continuous use. Its rpm is not regulated. Between the first electric fuel pump 2 and the second or high-pressure pump 3, there is a return line 10, which communicates with the tank 1 via a pressure regulator 11. The pressure regulator 11 is for instance a check valve which limits the pressure at the outlet of the first electric fuel pump 2 to a maximum value. The quantity of raw fuel metered into the evaporating device 6 is monitored and regulated with the aid of at least one monitoring device (not shown).

Page 11, please delete paragraph [0047].

Please replace paragraph [0048] with the following amended paragraph:

[0048] In Fig. 2, one embodiment of a reforming system of the invention with a pressure sensor is shown. Two electric fuel pumps 2, 3 connected in series serve to meter the raw fuel

into the evaporating device 6. In this preferred embodiment of the present invention, ~~a~~ the monitoring device is a pressure sensor 12, which measures the counterpressure in the evaporating device 6. The pressure sensor 12 measures the counterpressure at the outlet of the second electric fuel pump 3. The counterpressure increases as the metering quantity increases per unit of time. Therefore, from the counterpressure measured with the pressure sensor 12, the metering quantity per unit of time (volumetric flow) can be determined (actual value) and compared with the set-point value sought for the metering quantity per unit of time ~~(the volumetric flow)~~. Consequently, the control unit 8 uses the signal of the pressure sensor 12 for regulating the quantity of raw fuel delivered by the electric fuel pump into the evaporating device 6. A pressure sensor known from the prior art can be used as the pressure sensor 12. Optionally, a check valve 34 between the second electric fuel pump 3 and the evaporating device 6 prevents a reverse flow into the pumps or an imposition of pressure on the pumps. Another possibility is fine regulation of the metering quantity by means of a proportional valve 35 located in a bypass 36. As a result, if the quantity delivered by the electric fuel pumps 2 and 3 is too high, some of the raw fuel delivered can be returned via the bypass 36. The proportional valve 35 may control only a portion (such as 10%) of the maximum delivery quantity. By means of the bypass regulation, it is possible to control the metering quantity with deviations of less than 2% from the set-point value.

Page 12, please replace paragraph [0049] with the following amended paragraph:

[0049] As in the embodiment of the present invention shown in Fig. 1, the raw fuel 13 in Fig. 2 is metered into the evaporating device 6 via a first electric fuel pump 2 and a second, regulated metering pump 3, ~~(in this case also an electric fuel pump)~~. The measured values of the pressure sensor 12 are evaluated in the control unit 8. On the basis of these measured

values, the control unit regulates the rpm of the second electric fuel pump 3, (and thus indirectly the volumetric flow of fuel), by means of a timing module 14.

Please delete paragraph [0050].

Please replace paragraph [0051] with the following amended paragraph:

[0051] Fig. 3 shows a reforming system of the invention, with a device for monitoring the current consumption of the electric motor, and a graph showing the set-point/actual-value comparison of the current. The reforming system shown in Fig. 3 is constructed as in Fig. 1. In addition, a current consumption monitoring device 15 measures the current consumption of the electric motor 7 of the second high-pressure pump 3. The measured current consumption is compared in the control unit 8 with characteristic curves. This kind of set-point/actual-value comparison is shown in the graph at the bottom of Fig. 3.

Please replace paragraph [0052] with the following amended paragraph:

[0052] In this preferred embodiment of the present invention, a the monitoring device 15 monitors the current consumption of the regulated metering pump 3. The monitoring of the current consumption of the electric motor of the high-pressure pump (or of the electric fuel pump used as the metering pump) is effected via the control unit 8. For instance, from the current, conclusions can be drawn about sluggish operation (wear) or shearing off of the coupling of the electric motor. If for certain load states, defined current threshold values 16 are exceeded or undershot for longer than a length of time Δt, this can be ascribed to a malfunction of the electric motor and/or of the electric fuel pump. The metering range (delivery quantity) and, given normal function of the pump 3 and motor, the resultant current consumption are defined as the load state.

Page 13, please replace paragraph [0053] with the following amended paragraph:

[0053] In the graph at the bottom of Fig. 3, monitoring of the actual current value is shown for a defined load state (such as idling). The set-point value of the current I is located between the two threshold values 16. For regulating the pump 3, the actual or instantaneous current value I_{ist} is compared with the set-point current value $I_{\text{~~soll~~ set-point}}$. If the actual value deviates from the set-point value, the current is reregulated. In this schematic example, the actual current value I_{ist} is between the two current threshold values 16, and so no malfunction is found. If conversely the upper threshold value is exceeded for longer than a predetermined time Δt, or the lower threshold value is undershot for longer than Δt, then it must be concluded that there is a malfunction of the electric motor 7 of one of the electric fuel pumps 2, 3.

Please delete paragraph [0055].

Please replace paragraph [0056] with the following amended paragraph:

[0056] Fig. 4 shows a reforming system of the invention, with a flow sensor, and a graph showing the set-point/actual-value comparison of the metering quantity. In this preferred embodiment of the present invention, a monitoring device is a flow sensor 17, which detects the metering quantity of raw fuel into the evaporating device 6. A characteristic delivery curve as a function of the rpm of the regulated metering pump 3 is stored in memory in the control unit, for instance, and the metering quantity measured with the flow sensor is compared with the desired specifications. A deviation of the actual metering quantity for a certain rpm of the pump from the characteristic delivery curve can for instance be the consequence of a change in concentration, an air inclusion, a leak, or wear. To avoid incorrect metering of the raw fuel into the evaporating device, the rpm of the pump can be suitably increased or decreased in the event of such a deviation. If the metering quantity is

not increased or decreased as a result of this reregulation, then it must be concluded that there is a malfunction of the electric motor and/or of the regulated metering pump.

Page 14, please replace paragraph [0057] with the following amended paragraph:

[0057] The graph at the top of Fig. 4 schematically shows the same construction as Fig. 1. In addition, the reforming system of the invention shown includes the flow sensor 17, which measures the metering quantity of raw fuel through the line 5 into the evaporating device 6. The measured metering quantity is compared, as shown in the lower part of Fig. 4, with desired specifications. This graph illustrates the relationship between the rpm n and the metering quantity (volume per unit of time: V/t) for a high-pressure pump. If the actual values 18 of the metering quantity deviate from the set-point characteristic curve 19, then the control unit 8 reregulates the rpm of the electric motor 7 in order to arrive at the set-point metering quantity.

Please delete paragraph [0058].

Please replace paragraph [0059] with the following amended paragraph:

[0059] Fig. 5 shows a reforming system of the invention, with an rpm sensor, and a graph showing the set-point/actual-value comparison of the rpm. In this preferred embodiment of the present invention, a monitoring device is an rpm sensor 20, which measures the rpm of the metering pump. In the case of electric fuel pumps, the rpm can be ascertained by means of an integrated Hall sensor, for instance, or indirectly by way of the current consumption in conjunction with the voltage. By means of a set-point/actual-value comparison with a characteristic curve stored in memory in the control unit 8 (rpm as a function of the load state), deviations of the actual rpm from its set-point value are detected.

Page 15, please replace paragraph [0062] with the following amended paragraph:

[0062] Fig. 5c shows a graph for the set-point/actual-value comparison of the rpm **n**. The measured rpm **n** is compared with desired specifications. This graph shows the dependency of the rpm **n** on the load state L. A set-point characteristic curve 19 is specified for all the load states L from idling L_1 to full load L_2. Upon a deviation in the actual rpm values 18 from the set-point characteristic curve 19, the control unit 8 re-regulates the rpm of the electric motor 7 in order to reach the set-point metering quantity.

Please delete paragraph [0063].

Please replace paragraph [0064] with the following amended paragraph:

[0064] Fig. 6 shows a reforming system of the invention, with an rpm sensor 20 and a flow sensor 17. The rpm sensor 20 measures the rpm of the electric motor 7 of the high-pressure pump, and the flow sensor 17 measures the metering quantity into the evaporating device 6. ~~Consequently,~~ Thus, it is seen that the reforming system of the invention may include one or more monitoring devices. A combination comprising a plurality of monitoring devices increases the functional reliability of the electric motor and of the regulated electric fuel pump and furthermore makes high-precision regulation of the volumetric flow of raw fuel into the evaporating device possible.

Page 16, please delete paragraph [0065].

Please replace paragraph [0066] with the following amended paragraph:

[0066] Fig. 7 shows an embodiment of the rpm regulation of an electric fuel pump, in a reforming system of the invention. This involves a cascade regulation for the rpm. The rpm regulation includes two closed-loop control circuits: an "outer" closed-loop control circuit for rpm regulation, and an "inner" closed-loop control circuit for **regulating** current regulation.

The input variables for the "outer" control circuit are a set-point rpm $n_{soll\ set\text{-}point}$ and an actual rpm n_{ist}. The actual rpm is detected by means of an rpm sensor. By the comparison 23 between the set-point and actual rpm values, an rpm difference Δn rpm can be found, for instance when a different set-point rpm is specified. This rpm difference Δn rpm is sent to a first PID controller 24, which converts it into a set-point current value $I_{soll\ set\text{-}point}$. In the "inner" control circuit, a comparison 25 of the set-point current value $I_{soll\ set\text{-}point}$ with the actual current value I_{ist} of the pump motor 26 is made. The pump motor 26 is an electric motor, which drives the metering pump for metering the raw fuel. A resultant current difference ΔI between the set-point current value and the actual current value is compensated for by means of a second PID controller 27, which regulates the current for driving the pump motor 26. The "inner" control circuit serves, among other purposes, to compensate for transient problems, such as voltage dips or fluctuations in the commutator transition resistances. The "outer" control circuit serves to provide more-precise compensation of the set-point rpm (cascade regulation).

Please delete paragraph [0067].

Please replace paragraph [0068] with the following amended paragraph:

[0068] Fig. 8 shows a circuit diagram for a timing module for regulating an electric fuel pump in a reforming system of the invention. A pulse width modulated signal 28 serves to trigger and regulate the electric fuel pump 29. The pulse duty factor t/T of the signal 28 of the ON duration t to the period duration T. The transistor 30, by way of which the current intensity through the armature coil of the electric fuel pump 29 is regulated, is clocked with the signal 28. Via a measuring resistor 31, the actual value of the current is determined. The regulation of the current is effected as described for the "inner" control circuit in Fig. 7. A free-wheeling diode 32 serves to protect the electric fuel pump 29. The rpm of the electric

fuel pump can optionally be detected via a Hall sensor 33. This is an economical, small sensor that is implemented ~~in~~ into the electric fuel pump.

Please add the following new paragraph after paragraph [0068].

[0069] The foregoing relates to preferred exemplary embodiments of the invention, it being understood that other variants and embodiments thereof are possible within the spirit and scope of the invention, the latter being defined by the appended claims.

Please delete pages 18 and 19.